SCOPE

This section is intended to provide guidance to the contractor's quality control personnel and engineer's quality assurance and/or verification personnel for performing the quality management functions required under the various WisDOT Quality Management Program (QMP) provisions. The section provides references, procedures, and examples for inspection, sampling, testing, and documentation. The provision for the quality management program is the controlling document for the work. Both this section and the project provisions should be available to project quality management personnel who should become thoroughly familiar with their content.

QUALITY MANAGEMENT PROGRAM

The primary goals of the QMP are to provide consistent construction quality, ensure effective use of personnel, and maintain cooperation throughout all phases of the work. The foundation of the concept is to develop partnerships so that the exchange of information becomes commonplace. Working together will be enhanced if all participants communicate openly, honestly, and with respect for each other.

Before construction, the contract parties (contractor and engineer) should discuss the work included under the QMP provisions. Questions regarding QMP work should either be resolved or the mechanisms should be in place to resolve issues before the work begins.

HIGHWAY TECHNICIAN CERTIFICATION PROGRAM (HTCP)

The Highway Technician Certification Program (HTCP) is offered through the University of Wisconsin, Platteville, in association with the Wisconsin Department of Transportation. The QMP provisions require sampling and testing of material to be performed by a HTCP certified person. The HTCP, in consultation with WisDOT and industry, provides instruction and certifies that individuals have demonstrated the ability to perform quality management activities required for highway work contracted by WisDOT.

Some of the QMP provisions allow for an Assistant Certified Technician (ACT) to help conduct sampling, testing, and documentation. An ACT must successfully complete the ACT course and be registered by the department as an ACT before performing QMP sampling and testing. The ACT course and registration is administered through the HTCP. The director of the HTCP is responsible for the activities of the program. To receive information about the program, contact: Ray Spellman, HTCP Director, University of Wisconsin - Platteville, 49 Ottensman Hall, 1 University Plaza, Platteville, WI, 53818-3099; phone: (608) 342-1545, fax: (608) 342-1982, or check out the website at:

http://www.uwplatt.edu/htcp/

VERIFICATION

Verification sampling and testing will be performed by a department representative to validate the quality of the product. Verification testing will be performed on samples that are taken independently of the quality control samples. These samples will be collected in accordance with the QMP Provision. The verification personnel will also monitor the contractor control charts.

CONTRACTOR QUALITY CONTROL

The contractor will provide quality control (QC) personnel for the project to ensure production of quality products. As specified, personnel shall be provided for process control inspection, sampling, testing, documentation, and adjustments of the production and/or placement of the associated material. An appropriate number of persons shall be provided to perform the work in a timely manner. The personnel shall be certified at the level required by the provision. Certification of all technicians shall be by the Department's Highway Technician Certification Program. The contractor shall be responsible for the recognition of obvious defects and timely correction. The contractor should have skilled personnel able to make corrective action decisions when materials deviate from specification requirements.

Contractor Quality Control Plan

A quality control plan is required with some of the WisDOT QMP provisions. The purpose of the QC Plan is to explain how the contractor intends to control the equipment, materials, and processes to ensure the product is consistently within the specification limits. The plan should be flexible enough to allow for innovation and improvements during the course of the work.

The plan should outline the contractor’s material and construction control processes. It provides the engineer with assurance that the contractor has the ability to properly control and monitor the quality of the product.

Contractor Quality Control Plan – Aggregates

A quality control plan is required by this provision. The plan should outline the contractor’s material and construction control processes. It provides the engineer with assurance that the contractor has the ability to properly control and monitor the quality of the product. Items that should be considered for inclusion in the quality control plan are:

1. A list of QC personnel including certification status. The list shall include names and phone numbers of all individuals responsible for QC work and an organization chart showing lines of authority. Alternates should be identified.
2. A list of sources for all aggregate materials that will be used for the project that requires QC sampling and testing. This does not replace the Source of Materials report normally submitted to the engineer by the contractor; however, the information reported here may be taken from the Source of Materials report.
3. The pertinent Aggregate Quality Test results for the aggregate that will be included in the project that requires QC sampling and testing. This shall include wear, soundness, specific gravity, absorption, liquid limit, and plasticity index.
4. A description of the plant location(s) and provisions for stockpiling and/or hauling the material.
5. The location of the QC laboratory. Include the location(s) and a description of where any retained samples are to be stored.
6. Evidence of inspection or certification, and calibration records of all test equipment used for QC purposes. All equipment shall be in proper condition for use according to specifications before the work begins.
7. The posting location of control charts and other documentation (test records).
8. An outline of process control inspection activities for the plant(s) (include weighing, batching, mixing equipment), various materials handling processes, materials supplies and laboratory (equipment for sampling and testing).
    1. A list of proposed inspection to be conducted.
    2. The frequencies of inspection including changes for certain operations (start-up, process changes, adjustments, material changes).
    3. A description of the documentation that will be generated and where it will be filed.
9. An outline of process control sampling and testing activities to be conducted according to requirements of the specifications. Include:
    - A list of the tests the contractor proposes to conduct including any not in the specifications.

- The sampling and testing frequencies and any specifics regarding sampling associated with the work if different from the specifications.
- A description of the documentation process. Include where documentation will be filed and how often documents will be presented to the engineer.

10. An outline of the process adjustments that may be made to control quality.
    - A list of some typical adjustments in the process and general description of the conditions needed to cause the adjustments to be made.
    - A description of the documentation process including the items to be recorded.
11. An outline of the processes of communication by which QC information will be disseminated to the appropriate persons. The outline should include a list of recipients, the means of communication that will be used, and action time frames.
12. An outline of the mechanism to be followed in resolving a process control problem. Include:
    - Identification of the problem (i.e., observation of obviously defective material, observation of obviously defective work, equipment malfunction, test data in the warning band, test data outside the control limits, etc.)
    - An outline of typical steps to be taken to resolve the identified process problems and identification of who will perform each step. Present example(s).

QUALITY CONTROL LABORATORY AND EQUIPMENT

Laboratory

The contractor shall furnish and maintain a department-qualified laboratory as specified in the QMP provision. A qualified laboratory is required for all testing performed for acceptance of a product. Information on the Wisconsin Laboratory Qualification Program may be obtained from the Wisconsin Department of Transportation, Truax Center, 3502 Kinsman Blvd., Madison Wisconsin 53704; telephone 608-266-3246; or on the internet at:

http://www.dot.state.wi.us/

The laboratory should be set-up before the work starts. Set-up includes checking the adequacy of the water supply, connecting electrical power and telephones, and checking and calibrating laboratory equipment.

Equipment

The sampling and testing technicians shall have available the necessary equipment and supplies to perform quality control testing as specified in the QMP provision and standard spec 108.7. The equipment should be properly maintained. Should any equipment become defective during the course of the work, the provisions require for it to be to be repaired or replaced.

The contractor should maintain a record of calibration results at the laboratory or with the equipment. Equipment calibration should be performed according to the calibration requirements of the AASHTO or WisDOT test procedures for which the equipment is used. Questions regarding calibration requirements should be resolved with the engineer before the start of production.

QUALITY CONTROL START UP ACTIVITIES

The QC personnel should meet with the WisDOT QA and/or QV personnel before the start of project sampling and testing. Plans should be made to review sampling and testing processes, and the schedules for production. General information should be exchanged to establish proper communications on the project.

Before the start of production, the QC personnel should perform preliminary inspections of the materials and storage; set-up, check operation, and calibrate laboratory equipment; and set-up the required QC charts needed for the project.

INSPECTION

The contractor should inspect key construction processes on a regular schedule to ensure that all required equipment and materials are available on the job and the equipment is adequately maintained. The contractor is encouraged to develop check sheets for the routine inspections that will be performed. These sheets should be dated and initialed by the individual(s) performing the inspection(s).

Suggested inspections should include, but are not limited to, the following:

- Aggregate stockpiles.
- Materials storage.
- Plant(s).
- Hauling trucks.
- Laboratory sampling and testing equipment and tools.

SAMPLING AND TESTING

General

The contractor QC personnel shall conduct sampling and testing at the frequencies outlined in the provisions. The specified sampling and testing frequencies are the minimum required for the project. The contractor may conduct increased sampling and testing at any time to supplement the specified work.

The QC test results should be used to ensure material compliance with the specifications. One sampling method should be adhered to throughout the work to facilitate data comparisons for the project. As required by the provisions, the contractor shall respond to failing tests by taking appropriate action to modify the production operation(s) to achieve specification conformance.

Random Sampling

The QMP special provisions often require the contractor to test randomly selected samples. The intention of random sampling is to eliminate bias in the sample selection process. The standard method recommended for selecting random sample locations is ASTM Method D 3665, "Standard Practice for Random Sampling of Construction Materials." Random numbers may be selected by following the instructions of the ASTM, using a calculator with a random number generator, or another common method of selecting random numbers acceptable to the engineer.

Random sample locations are required to be selected by a certified technician. To fully ensure the selection of samples is random, the information should only be shared with those who need it. Operator(s) shall not be advised in advance as to when samples are to be taken. Collusion between the QC personnel and production or placement operator(s), in this regard, will be cause for removal of the QC technician from the project.

For sample location selection, the QC technician should develop, in advance, the sampling schedule for the work. At the beginning of each day the contractor should inform the QC technician of the intended material production or placement for the day. Based on this estimate, the technician can determine the required number of sublots according to the sampling frequencies of the provision, and determine a random sample location for each sublot. Sample locations may be defined in terms of quantity, position on the grade, or another appropriate transformation of the sampling frequencies defined in the specification.

For placement sampling, the sample locations based on quantity can be converted to correspond to project stationing. Then, if samples are being collected of an in place material, a random number should be used to determine a baseline offset or transverse location at the chosen station.

The following three examples further describe the random sampling methods during production and placement.

Example 1: Base Course Production Sampling

At the initial production of a base aggregate, a contractor plans to produce 3900 tons of base course in an 8 hour day.

From the QMP Base special provision, during initial production, a minimum of 1 sample per 1500 tons is required.

The QC technician would first determine the number of sublots required for the day by dividing the estimate of the daily production by the maximum sublot quantity.

3900 tons/ 1500 tons = 2.6 sublots, round to 3 sublots

The sample location of each in each sublot shall be determined by selecting a random number for the sublot. The random number is then multiplied by the quantity of material in each sublot. This quantity shall then be added to the final quantity of the previous sublot to yield the approximate total quantity of when the samples are to be taken. These quantity sample locations can be divided by the anticipated rate of production to determine the approximate time after start up of when these samples might be collected. Collection, however, should be based on the actual tonnage produced, not on the production rate estimate. The calculations for this process follow:

Sample	Quantity Range (tons)	Random Number	Sublot Sample Point	+ Tons in Prior Sublot	Sampling Point	Production Rate	Approximate Time
1	0-1500	X 0.569	=854	+0	= 854	/ 490	1 hr. 45 min.
2	1501-3000	X 0.335	=503	+ 1500	= 2003	/ 490	4 hr. 05 min.
3	3001-3900	X 0.802	= 722	+ 3000	= 3722	/ 490	7 hr. 36 min.

This procedure is to be used for any number of samples selected randomly per day. Field staff can calculate and record the random sample site locations on form WS3011 "Production Sample Locations". An example is provided in Figure 1.

PRODUCTION SAMPLE LOCATIONS

PROJECT DESCRIPTION		GENERAL INFORMATION
Project ID.	Contract	Material Source
Highway	County	Material (Type, Grade, Etc.)
Description		Tester:
Contractor		

Date/ Start Time/ Est. Prod. (tons)	Sample Number	Sublot Size (tons)	Random Number	Sample Point (tons)	Sublot Prior Sublots (tons)	Sample Point (tons)	Estimated Production Rate (tons/hr)	Approx. Time Interval (hours)	Approx. Sample Time (hour:minute)	Actual Production Rate (tons/hr)	Comments
3/3/99	33P-1	1500	0.596	894	0	894	450	1.99	9:00 AM	480	
7:00 AM	33P-2	1500	0.491	737	1500	2237	480	4.66	11:00 AM	475	
4500	33P-3	1500	0.93	1395	3000	4395	475				Crusher breakdown 2pm, no
											sample taken.
3/4/99	34P-4	1200	0.262	314	0	314	480	0.65	7:40 AM	480	
7:00 AM	34P-5	1200	0.135	162	1200	1362	480	2.84	9:50 AM	470	
4800	34P-6	1200	0.383	460	2400	2860	470	6.09	1:05 PM	470	
	34P-7	1200	0.943	1131	3600	3731	470	7.94	2:55 PM		
3/5/99	35P-8	1200	0.37	444	0	444	470	0.94	7:55 AM	475	
7:00 AM	35P-9	1200	0.367	441	1200	1641	475	3.45	10:27 AM		3 consecutive 4 pt. ave. in WL;
4700	35P-10	1200	0.619	743	2400	3143					therefore, move to 1 test/day
	35P-11	1200	0.334	401	3600	4001					

Figure 1: Example Production Sample Locations, Form WS3011

Example2: Sampling

A contractor plans to pave 3000 feet of concrete in a day.

Paving begins at station 115+23.

The pavement is 26 feet wide, and 10 inches thick.

There is a paving gap from Station 131+07 to 132+62 (155 feet).

From the QMP, Concrete Pavement special provision, test samples are required once per 500 cubic yards of material placed.

To determine random sample locations, the frequency of sampling is first converted to pavement length:

$$(500\ \text{CY})\left(\frac{27\ \text{feet}^3}{1\ \text{CY}}\right)\left(\frac{12\ \text{inches}}{1\ \text{foot}}\right)\left(\frac{1}{10\ \text{inches}}\right)\left(\frac{1}{26\ \text{feet}}\right) = 623\ \text{feet}.$$

The anticipated 3000-foot lot is then divided into individual 623-foot sublot lengths. A random number is chosen for each sublot and is multiplied by the 623-foot sublot length. This is then added to the beginning station of the sublot to determine the sample station.

For sampling, the beginning paving station is 115+23.

Sublot Beginning Station	Sampling Frequency (feet)	Random Number	Sublot Sample Point	Sample Station
115+23	623	0.164	102	116+25
121+46	623	0.336	209	123+55
127+69	623	0.763	475 + 155 Gap	133+99
Gap 155'				
135+47	623	0.481	300	138+47
141+70	623	0.786	490	146+60
147+93	623	0.094	59	148+52

Form WS3011, or a similar sheet, should be used to calculate and record the random sample locations. Figure 2 illustrates use of this sheet.

PLACEMENT TEST SITE SAMPLE LOCATIONS

PROJECT DESCRIPTION		GENERAL INFORMATION	
Project ID.	Contract	Material Source:	Placement Width:
Highway	County	Material (Type, Grade, Etc.):	Material Density:
Description		Tester:	Placement thickness:
Contractor		Project Length:	Placement (ton/sta):

Date/ Est. Placement	Sample Number	Sublot Size (tons)	Beginning Sublot Station	Sublot Length	Random Number	Sublot Sample Point	Sublot Sample Station	Random Number	Sample Offset	Comments
5/1/1998	51S-1	2000	100+00	50+00	0.256	1280	112+80	0.966	34.8	2 tests required for > 3000 T placed, est. placement
4000 T	51S-2	2000	150+00	50+00	0.148	740	157+40	0.346	12.5	is 4000 T; therefore 2 samples at 2000 T sublots.
5/2/1998	52S-3	2500	200+00	62+50	0.613	4766	247+66	0.715	25.7	2 tests required for > 3000 T placed, est. placement
5000 T	52S-4	2500	262+50	62+50	0.763	4769	310+19	0.297	10.7	is 5000 T; therefore 2 samples at 2500 T sublots.

Figure 2: Example Production Sample Locations, Form WS3011

Example 3: Placement With Baseline Offset Sampling

For determining a station/offset sample location for sampling in-place base course, a random sample station is first chosen as defined in the previous section. Next a random offset distance, from a field alignment base line, is determined. For this example, assume the width is 36 feet. The random number 0.683 is chosen. The offset from the base line (either side, but stay constant throughout the contract) is 36 X 0.683 = 25 feet rounded to nearest foot.

If the base course layer is too thick for placement in one lift, then separate sampling is required of each lift. Base course samples should be taken from full depth areas of the base course layer (shoulder point to shoulder point).

Retained Samples

The QC personnel may need to retain split or companion samples of material for quality assurance, independent assurance testing, or dispute resolution as specified by the provision. As soon as samples have been portioned for QC and Department testing, the samples are required to be identified properly with a suitable identification tag. Tags should include the following:

- WisDOT project I.D. number.
- highway designation.
- county.
- highway project limits.
- contractor.
- sample number.
- date and time sampled .
- material source, type & grade.
- sample location. (tonnage at point of sampling, station number, offset & layer, etc.)
- name of sampler.
- other pertinent test results.

The identification tag shall stay with the sample until the sample is discarded. Markings on the tags should be permanent. Samples are to be stored in a protected location for the time period required by the provision.

Additional Samples

The QMP provisions provide for the engineer to direct the contractor (QC personnel) to take additional samples. The additional sampling may be requested to observe the QC technician’s sampling and/or testing technique or to evaluate questionable materials identified by the engineer. The test results from additional samples should be plotted on the control chart as a non-random test and not included in the running average (except for QMP, Asphaltic Mixture tests conducted by the contractor are included in the running average).

The specified frequencies represent the minimum sampling and testing for the project. The contractor may increase the frequency of testing for reasons of his own. The interval for increased testing shall be communicated to the engineer as required by the provision.

Process Control Adjustments

The contractor is responsible for making process adjustments to control or improve the quality of the product. Some adjustments are made out of necessity, such as when a problem exists and an immediate reaction by the contractor is necessary. Other adjustments may be made to fine-tune the process. In all cases, the contractor should advise the engineer of adjustments along with pertinent information concerning the changes made.

Documentation

The contractor is required by the QMP provision to document all quality control work for the project by providing and maintaining written records and control charts.

When the project is complete, the contractor records for the work shall be furnished to the engineer in a neat and organized manner. These records will become part of the final project records. It should be assumed by those preparing them that the records must withstand any review or analysis in future years.

The contractor is encouraged to use computer programs to handle recording and analysis of the process control data. In addition to saving a great deal of time, concern about errors through data transfer will be eliminated. WisDOT will work with the contractor to accomplish computer uses. Use of portable personal computers will permit technicians to input sampling and testing data directly in the field. Data may then be submitted electronically in lieu of paper copies. In these cases, sufficient backup files should be made to properly insure retention of the information contained.

Records

The contractor shall record observations, inspections, adjustments and test results according to the QMP provision. Recording should be done in a timely manner, preferably upon occurrence of the activity. The information should be reported in a permanent field record book.

The records should contain sufficient detail to sustain an audit, and be clear enough to be read and understood by persons not associated with the project. Emphasis should be placed on neatness. Computation records should be clear, precise, accurate, and complete. Computations should be initialed and checked. The records should also include documentation of significant conversations of project personnel, meetings, disputes, and subsequent decisions.

Control Charts

Control charts are graphs that depict the variation of a measured characteristic with time. Standardized control charts should be maintained by the contractor QC staff at a location agreed upon by the contractor and engineer, typically the field office. If quality control testing is being performed at more than one site for the material, the QMP provisions require separate control charts for each site.

Control charts include both upper and lower control limits and upper and lower warning limits as appropriate. The area between the control limit and warning limit is the warning band.

Individual test results obtained by the contractor are required to be recorded on the control charts as soon as possible on the same day the tests are run. The department results should be posted as soon as the data is available.

Control charts should contain pertinent identification information as well as the plotted data. In addition to the individual contractor QC and engineer Qa or Qv & IAP test points a running average of the four latest QC data points shall be plotted.

The following control chart legend is used throughout the control chart examples in this manual:

Upper control limit (JMF limit) = UCL
Upper warning limit = UWL
Upper warning band = UWB
Lower control limit (JMF limit) = LCL
Lower warning limit = LWL
Lower warning band = LWB
QC Individual Test Result.. ●
QC Running Average of 4 .... △
QC Non-Random Test .... O
QA or Verification Individual Test Result X
Independent Assurance Test Result........................... ✦

Field staff can download form WS3015 "Running Average Calculations." It is a generic sheet for computing the four point running averages. An example is shown below in Figure 3.

RUNNING AVERAGE CALCULATIONS		
PROJECT DESCRIPTION		SAMPLE INFORMATION
Project ID.	Contract	Matrerial Source
Highway	County	Material (Type, Grade, Etc.)
Description		
Contractor		
Material Test:		

Date	Test Number	Test Result	Sum of Last 4 Values	4 Point Running Average	Date	Test Number	Test Result	Sum of Last 4 Values	4 Point Running Average
	41P-1	63.0							
	41P-2	57.0							
	41P-3	63.8							
	42P-4	56.9	240.7	60.2					
	42P-5	58.6	236.3	59.1					
	42P-6	64.8	244.1	61.0					
	43P-7	62.5	242.8	60.7					
	43P-8	53.0	238.9	59.7					
	44P-9	68.7	249.0	62.3					
	44P-10	60.1	244.3	61.1					
	45P-11	60.3	242.1	60.5					
	46P-12	58.9	248.0	62.0					
	47P-13	67.1	246.4	61.6					
	48P-14	63.5	249.8	62.5					

Figure 3: Example Running Average Calculations, Form WS 3015

This example illustrates a typical method for computing the 4-point running average values and plotting the individual and 4 point running average test results. The example utilizes aggregate gradation data for the 3/8-inch sieve fraction.

Test Number	Test % Pass 3/8"	Sum of Last 4 Values	Average of Last 4 Values, % Pass 3/8"
1	60	--	--
2	62	--	--
3	61	--	--
4	64	247	62
5	62	249	62
6	58	245	61
7	57	241	60
8	60	237	59
9	62	237	59
10	65	244	61

Figure 4: Aggregate Gradation Control Chart, 3/8” Sieve

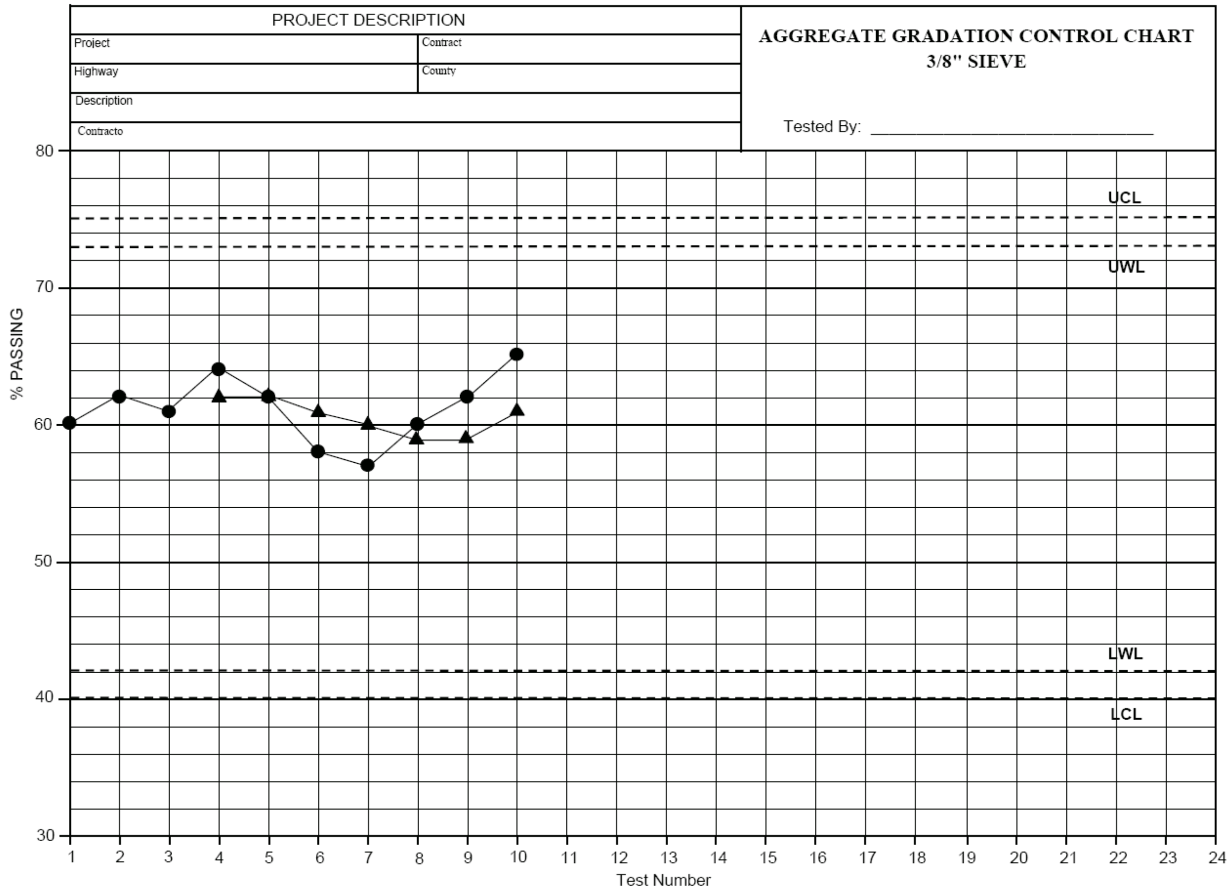

Figure 5: Example Aggregate Gradation Control Chart, 3/8" Sieve, Form WS3017

Gradation data can be plotted on Form WS3017 "Aggregate Gradation Control Chart". As shown in Figure 5 above, the control limits (specification limits) are 40 and 75%. The upper and lower warning limits (two percentage point warning band inside the control limits) are 42 and 73% respectively as defined by the QMP provision.

Ideally, test results should be near the specification mid-points. This will best ensure that the contractor will avoid exceeding the specified limits. Operating near the limits represents an insecure situation for the contractor.

CORRECTIVE ACTION

Control charts provide a means for the contractor to identify when corrections should be made in the process. Process trends can be more easily recognized by plotting the test result data. The test result plots, particularly those for the running average values, show trends as they develop. As the running average approaches the limits, the contractor should assess his/her options and correct the process.

The data plots will not identify the source of the process variability. When a contractor investigates an undesirable trend it may be determined that something (an assignable cause) happened in the process that caused the trend. For example, when a hole develops in a sieve and increases in size with use, the sieve should be found and replaced with a suitable sieve before the process advanced to a point where test results would be out of specification.

Control charts can provide an early detection system for identifying potential trouble spots for the contractor. The contractor should review control charts regularly to stay on top of the production process. The prudent contractor and QC staff will watch the data trend and take corrective action as soon as test data confirms something is not right in the process.

Corrective actions are required to always be documented. The corrective action undertaken may be to inspect laboratory equipment, inspect plant or placement equipment, make adjustments in the process, change materials or equipment, or a combination of these actions. When adjustments are made, an increase in the frequency of sampling and testing may be required to ensure the adjustments were adequate. In addition to documenting corrective actions, resulting effects of the corrective actions should be recorded.

The QMP provisions suggest the contractor consider corrective action when the running average is towards a warning limit. Corrective action is required when two consecutive running average points exceed a warning limit. In addition, most of the QMP provisions require action when an individual test result exceeds a control limit. The specific provision that is being used should be reviewed to determine when and what action is required for situations when test results exceed a specification limit and to assess the effectiveness of corrective action.

TESTING PRECISION

The QMP provisions specify allowable differences between engineer and contractor test results. The contractor should be aware of these differences and the importance that QC test results be comparable to the department test results. Furthermore, the contractor should be aware that if test comparisons exceed allowable differences, the engineer will investigate the reason immediately. The contractor should want to make every effort to ensure his/her operations, equipment, and procedures are correct.

DISPUTE RESOLUTION

The QMP provisions present methods for resolution of disputes through referee laboratory testing if the contractor and engineer cannot resolve a test result and/or procedure difference.

WISDOT GUIDELINES TO ADDRESS CONTRACTOR NON-PERFORMANCE OF QMP SAMPLING & TESTING

It is the contractor's responsibility to perform the quality control work according to the specification. With the QMP specifications, the contractor's quality control (QC) test results and documentation serve as the primary means for determining if materials conform to the specifications, and for calculating pay adjustments.

It is the project engineering team's responsibility to monitor the contractor's quality control program (QC). As the work is being performed, the engineer should monitor the contractor's sampling, testing, and documentation. To monitor test results, the engineer should request that the QC technician post documentation (control charts and or test summary reports) in a location easily accessible to the engineer. Electronic transfer or faxing of information is an option. With fax transfers, the engineer should keep in mind the amount of time and paper that this requires. The engineer should routinely monitor the test documentation to ensure that the contractor is properly performing under the specification.

The primary objective of both the contractor and engineer is to work together to ensure compliance with QMP sampling and testing requirements.

For contractor QMP non-performance, the engineer should notify the contractor early to address the problem. If the contractor responds immediately and is able to correct the non-performance issue, no further action may be necessary. If non-performance continues, the engineer should consider one or more of the following options, but may use other alternatives:

1. Suspend or delay contract operations as provided in standard spec 105.
2. Withhold payment of the material bid item not properly sampled and/or tested until the contractor supplies adequate pre-placement or in-place test results, or demonstrates material compliance in a manner acceptable to the engineer. The engineer must document the approved acceptance, or require removal and replacement of the material. The engineer's acceptance may lead to a price adjustment for the improperly tested or untested material. If the contractor demonstrates material compliance in a manner acceptable to the engineer, a price adjustment for the material is not necessary.
3. Partially or completely withhold payment of the QMP bid item for the amount of material represented.

The following table presents general guidelines to address QMP non-performance problems. The engineer should carefully evaluate each problem situation encountered in order to determine the applicability of these guidelines.

Problem Encountered	Action Taken
Non-random tests. Moving of test location.	Do not pay for the QMP bid item for the amount of material represented. Require resampling and testing of the material in a random location. If random sampling cannot be done, deduct 10% of the material bid item price for the amount of material represented and allowed to remain in-place.
Improper: Sampling, testing, or documentation methods. Testing equipment.	Require resampling and testing using proper methods. If retesting cannot be done, deduct 10–100% of QMP bid item price for the amount of represented material. Also, deduct 10 –50% of the material bid item price for the amount of material represented and allowed to remain in-place.
Calculation error.	Correct the calculation. Address non-conforming material separately.
Tester not certified. ACT certified w/o direct supervision. Laboratory not qualified. Too few tests. Tester not present.	Do not pay for the QMP bid item for the amount of material represented. Require resampling and testing using a certified tester and a qualified laboratory. If retesting cannot be done, deduct 10 –50% of the material bid item price for the amount of material represented and allowed to remain in-place.
No tests.	Do not pay for the QMP bid item. Require removal and replacement of the material unless the contractor can demonstrate, in a manner acceptable to the engineer, that the material complies with the specification. If compliance cannot be demonstrated and the engineer allows the material to remain in-place, deduct 50% of the represented material bid item.

Table 1: General QMP – QC Testing Problems Encountered

NOTES:

Where a price deduction range is given in the preceding guidelines, the engineer should take into account the severity of the non-conformance when choosing the deduction.

The upper limit of the materials cost deduction is shown at 50% of the item price, since the materials cost can often be about 50% of the bid item cost. For some bid items the materials costs can be significantly less. For the more severe cases, the engineer should consider deducting the total cost of the materials for the bid item.

For resampling and testing, the contractor shall demonstrate the material compliance using a method acceptable to the engineer.

When QMP sampling and testing is incidental to the work, the engineer will not have a QMP bid item. In these cases, the engineer can take a credit based on WisDOT's historical costs for this sampling and testing or the contractor's documented costs. If the contractor fails to perform the work required by contract, the department will reduce the contractor's pay and administer that pay reduction under the Non-Performance of QMP Administrative item.